CLAIMS

1. (Currently Amended) A method for measuring the flow velocity of a fluid flowing through a conduit, ~~an elongated body substantially along the longest axis of the elongated body,~~ the method comprising:

providing an array of at least two ultrasonic sensor units disposed at predetermined locations along a longitudinal axis of the conduit, ~~the elongated body,~~ each sensor unit including an ultrasonic transmitter and an ultrasonic receiver, each sensor unit providing a respective sensor signal indicative of a parameter of an ultrasonic signal propagating between each respective ultrasonic transmitter and ultrasonic receiver;

processing the ~~transit time~~ sensor signals to define a convective ridge in the k-ω plane; and

determining the slope of at least a portion of the convective ridge to determine the flow velocity of the fluid.

2. (Currently Amended) The method of claim 1, wherein the processing of the sensor ~~transit time~~ signals comprises:

sampling the ~~transit time~~ sensor signals over a predetermined time period;

accumulating the sampled ~~transit time~~ sensor signals over a predetermined sampling period; and

processing the sampled ~~transit time~~ sensor signals to define the convective ridge in the k-ω plane.

3. (Original) The method of claim 1, further comprising:

determining the orientation of the convective ridge in the k-ω plane.

4. (Currently Amended) The method of claim 1, wherein the ~~transit time~~ sensor signals are indicative of vortical disturbances within the fluid.

5. (Currently Amended) The method of claim 1, wherein the processing the ~~transit time~~ sensor signals comprises:

performing a beam forming algorithm.

6. (Original) The method of claim 5, wherein the beam forming algorithm includes one of a Capon Algorithm and MUSIC Algorithm.

7. (Original) The method of claim 1, wherein the determining the slope of at least a portion of the convective ridge comprises:

approximating the convective ridge as a straight line.

8. (Original) The method of claim 1, wherein the providing an array of at least two ultrasonic sensor units comprises:

disposing the ultrasonic transmitter and ultrasonic receiver of a sensor unit such that the ultrasonic signal propagating therebetween is orthogonal to the direction of the fluid flow.

9. (Currently Amended) The method of claim 1, further including:

determining the cross-sectional area of the conduit; ~~elongated body;~~ and

determining the volumetric flow rate of the fluid.

10. (Currently Amended) The method of claim 1, wherein the parameter of the ultrasonic signals are ~~signal is~~ at least one of the amplitude and the transit time.

11. (Currently Amended) An apparatus for measuring the flow velocity of a fluid flowing through a conduit, ~~an elongated body substantially along the longest axis of the elongated body,~~ the apparatus comprising:

an array of at least two ultrasonic sensor units disposed at predetermined locations along the ~~elongated body,~~ conduit, each sensor unit including an ultrasonic transmitter and an ultrasonic receiver, each sensor unit providing a respective sensor signal indicative of a parameter of an ultrasonic signal propagating between each respective ultrasonic transmitter and ultrasonic receiver; and

a processor that defines a convective ridge in the k-ω plane in response to the sensor ~~ultrasonic~~ signals, and determines the slope of at least a portion of the convective ridge to determine the flow velocity of the fluid.

12. (Currently Amended) The apparatus of claim 11, wherein the processor samples the ~~ultrasonic~~ sensor signals over a predetermined time period, accumulates the sampled sensor ~~ultrasonic~~ signals over a predetermined sampling period, and processes the sampled sensor ~~ultrasonic~~ signals to define the convective ridge in the k-ω plane.

13. (Original) The apparatus of claim 11, wherein the processor further determines the orientation of the convective ridge in the k-ω plane.

14. (Currently Amended) The apparatus of claim 11, wherein the ~~ultrasonic~~ sensor signals are indicative of vortical disturbances with the fluid.

15. (Original) The apparatus of claim 11, wherein the processor uses a beam forming algorithm to define the convective ridge in the k-ω plane.

16. (Original) The method of claim 15, wherein the beam forming algorithm includes one of a Capon Algorithm and a MUSIC Algorithm.

17. (Original) The apparatus of claim 11, wherein the processor determines the slope of at least a portion of the convective ridge by approximating the convective ridge as a straight line.

18. (Original) The apparatus of claim 11, wherein the ultrasonic transmitter and ultrasonic receiver of a sensor unit are disposed such that the ultrasonic signal propagating therebetween is orthogonal to the direction of the fluid flow.

19. (Currently Amended) The apparatus of claim 11, wherein the processor further determines the cross-sectional area of the conduit, ~~elongated body,~~ and determines the volumetric flow rate of the fluid.

20. (Currently Amended) The apparatus of claim 11, wherein the parameter of the sensor signals are ~~ultrasonic signal is~~ at least one of the amplitude and the transit time.

21. (Currently Amended) An apparatus for measuring the flow velocity of a fluid flowing through a conduit, ~~an elongated body substantially along the longest axis of the elongated body,~~ the apparatus comprising:

an array of at least two ultrasonic sensor units disposed at predetermined locations along the conduit, ~~elongated body,~~ each sensor unit including an ultrasonic transmitter and an ultrasonic receiver, each sensor unit providing a respective sensor signal indicative of a parameter of an ultrasonic signal propagating between each respective ultrasonic transmitter and ultrasonic receiver;

means for processing the ~~ultrasonic~~ sensor signals to define a convective ridge in the k-ω plane; and

means for determining the slope of at least a portion of the convective ridge to determine the flow velocity of the fluid.

22. (New) An apparatus for measuring the flow velocity of a fluid flowing through a conduit, the apparatus comprising:

an array of at least three ultrasonic sensor units disposed at predetermined locations along the conduit, each sensor unit including an ultrasonic transmitter and an ultrasonic, each sensor unit providing a respective sensor signal indicative of a parameter of an ultrasonic signal propagating between each respective ultrasonic transmitter and ultrasonic receiver; and

a processor using an array processing algorithm determines the flow velocity of the fluid in response to the sensor signals.

23. (New) The apparatus of claim 22, wherein the ultrasonic transmitter and the ultrasonic receiver are disposed such that the ultrasonic signal propagating therebetween is orthogonal to the direction of the fluid flow.

24. (New) The apparatus of claim 22, wherein the at least 2 sensor units comprise an array of sensor units comprising at least 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, or 16 sensor units.

25. (New) The apparatus of claim 11, wherein the ultrasonic sensor units are mounted to an outer surface of the conduit or mounted within the conduit to contact the fluid.

26. (New) The apparatus of claim 11, wherein the fluid is one of a single phase fluid, multi-phase fluid, aerated fluid, three phase fluid or slurry.

27. (New) The apparatus of claim 11, wherein the sensor units are disposed in pitch-catch configuration wherein the transmitter and receiver are mounted opposing each other or mounted adjacent each other.

28. (New) The apparatus of claim 11, wherein the sensor units are disposed in a pulse-echo configuration.

29. (New) The apparatus of claim 11, wherein the at least 2 sensor units comprise an array of sensor units comprising at least 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, or 16 sensor units.